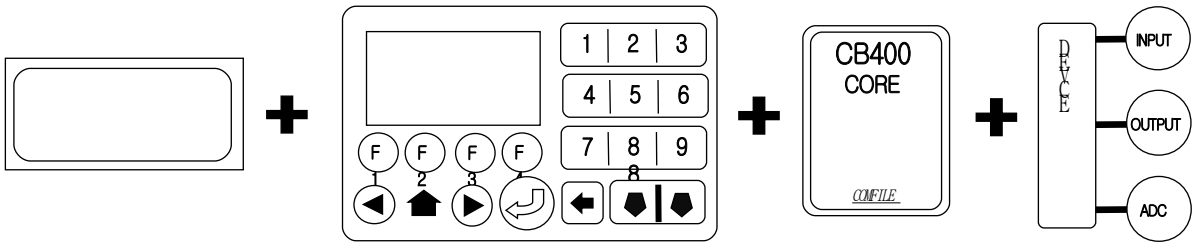
User Interface Panel

UISB-420T

1. Product Overview

The UISB-420T is an integrated character LCD, keypad, I/O controller powered by a Cubloc CB400 core. It can be programmed with Cubloc Studio.



Character LCD (CLCD) | Keypad | Cubloc (CB400) | I/O

The UIF-420T makes it easy to quickly add a user interface to an industrial system at low cost. Characters, numbers, and symbols are displayed on the LCD providing textual output to the user. User input is activated by pressing buttons on the keypad and processed by the CB400 core module. In addition the rear panel contains various I/O and communication ports that be used to monitor and control industrial systems.

2. Features

1) Powered by an integrated Cubloc CB400
2) Integrated Keypad [See the `Set Pad` command in Cubloc Studio]
4) Integrated ASCII Character LCD [See the `Set Display` command in Cubloc Studio]
5) 16 16~24V Digital Inputs
6) 16 Open Collector Digital Outputs
7) 4 10-bit 0~20mA Analog Inputs
8) 4 10-bit 0~10V Analog Inputs
9) LCD Software Controllable Backlight (On/Off)
10) 4 LED Indicators
11) Software Controllable Piezo Buzzer
12) Software Controllable Audio Keypress Feedback (On/Off)
13) RS-232/RS-485 Serial Communication

3. Specifications

1) Power

Supply Voltage	9~24 VDC
Power Consumption	1.2 W, **Max** 1.6 VA

2) Operating Environment

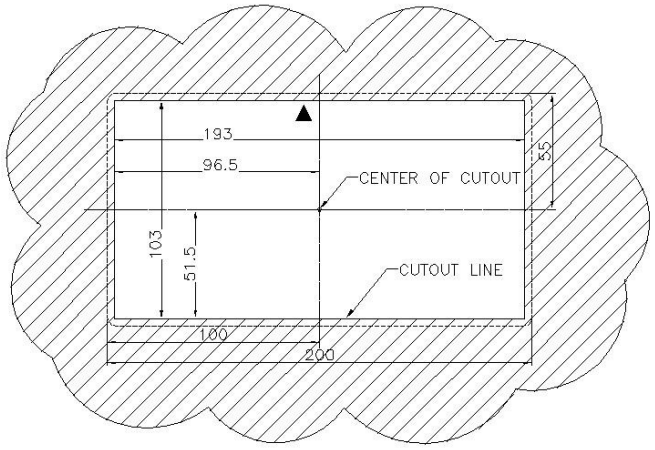
Operating Temperature	0~50 ℃
Operating Humidity	35~85 %RH (No Condensation)

3) Membrane

Switch Life	Push 100,000 times
Force	250gf

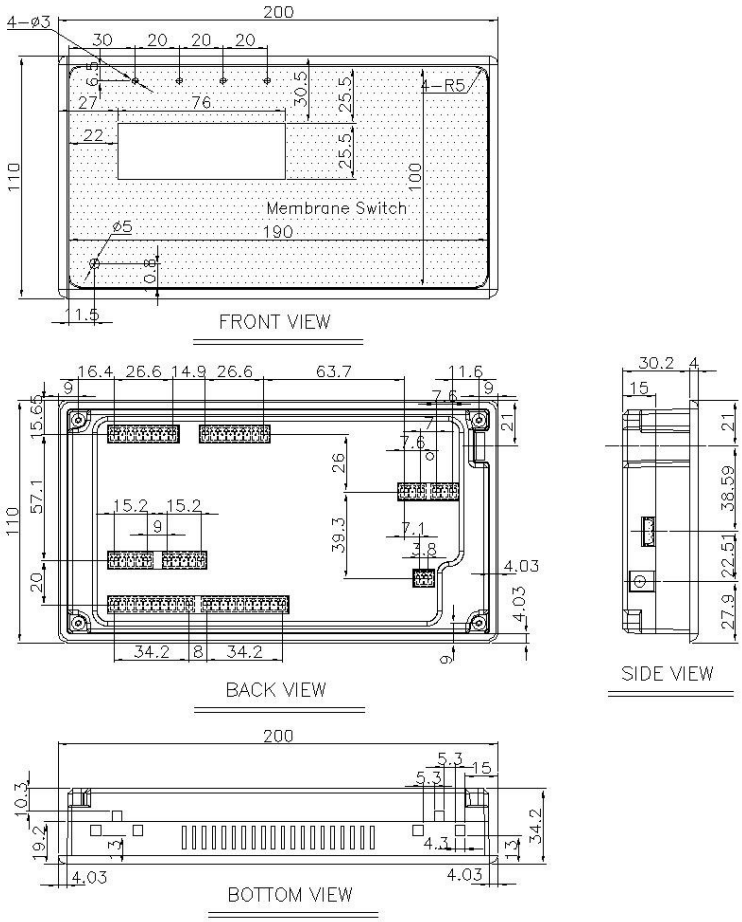
4. Dimensions

▌Panel Dimensions



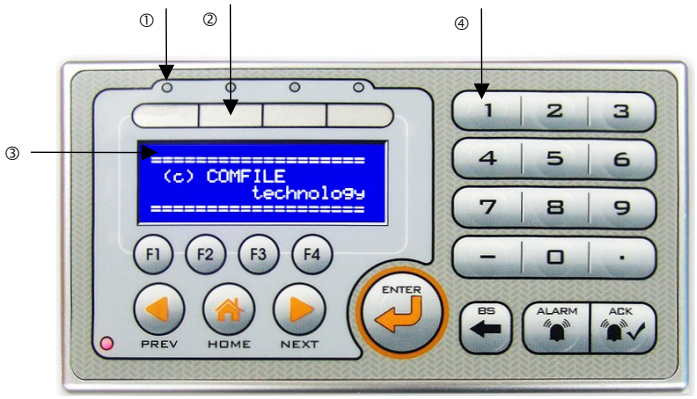
UIF420 PANEL CUTOUT – BACK VIEW Unit: mm

▌Port Dimensions



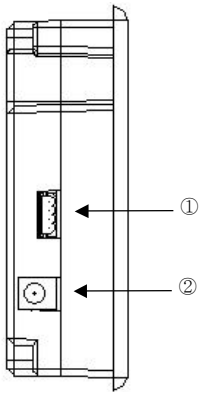
5. Parts and Functions

Front



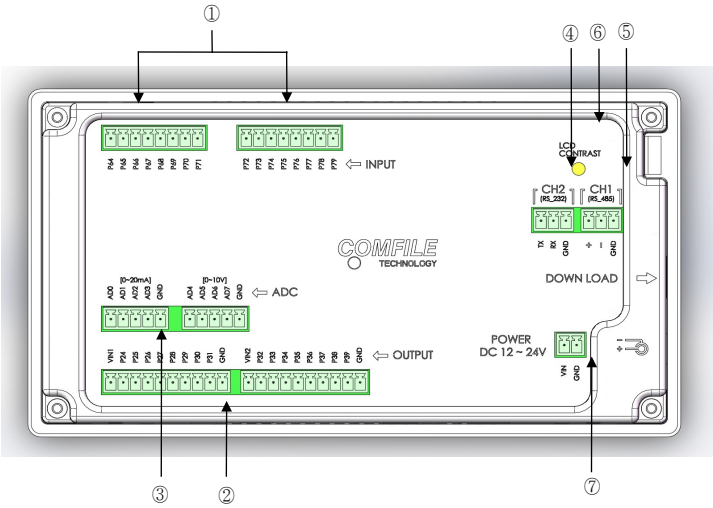
	Item	Description
①	LED	LED Indicators
②	Text Strip	For labeling indicators with a pen.
③	Charact er LCD	Display letters, number, and symbols
④	Key	Keypad buttons

Side



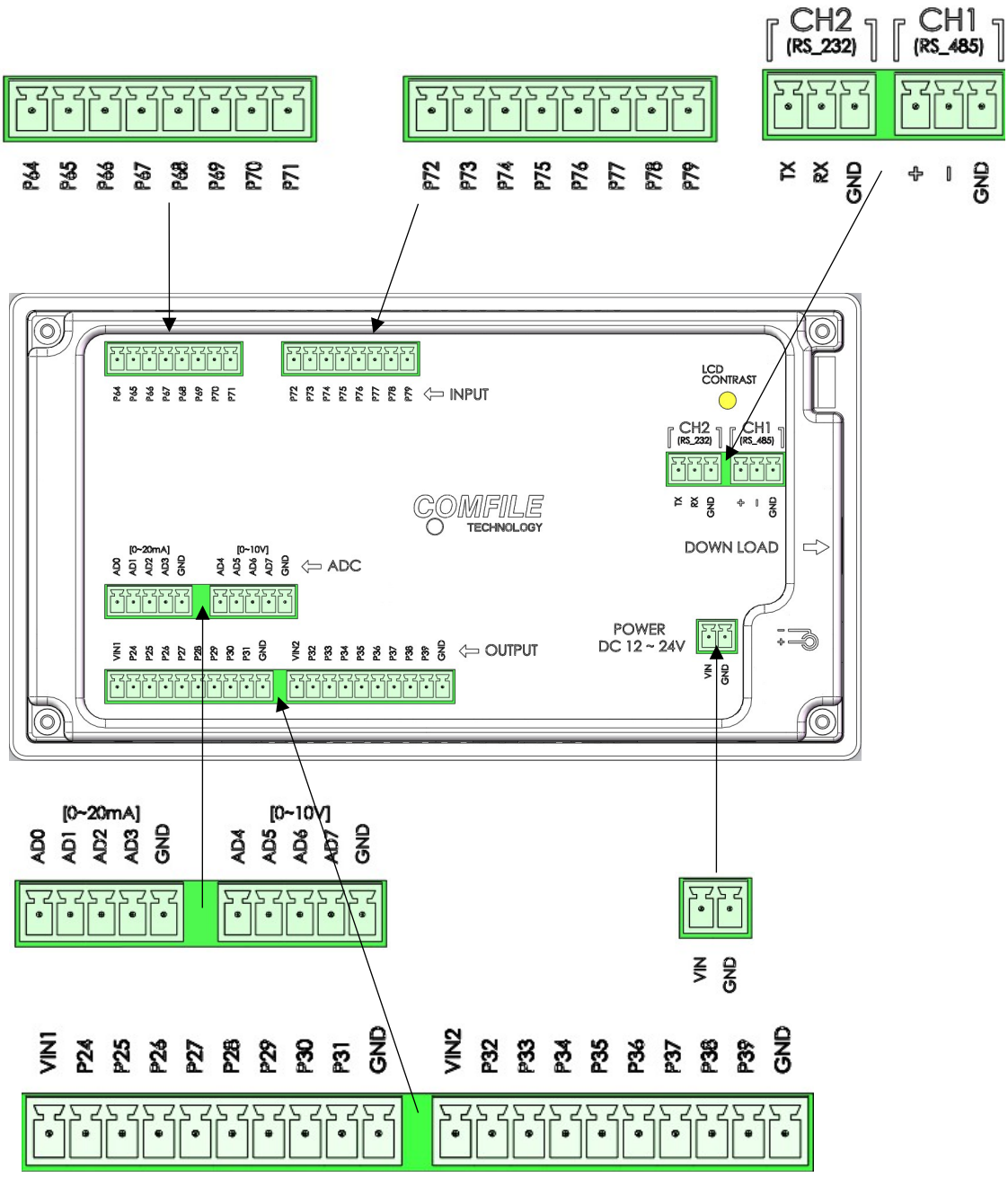
	Item	Description
①	Download Port	For downloading programs from Cubloc Studio
②	Power Connection	DC 9~24V

Rear



	Item	Description
①	Inputs	16~24VDC Digital Inputs
②	Outputs	Open Collector Outputs
③	ADC	0~20mA / 0~10VDC ADC
④	RS-232	RS-232 Channel 2
⑤	RS-485	RS-485 Channel1
⑥	VR	LCD Brightness Control
⑦	Power	DC 9~24V Power Supply Terminal

Rear I/O Ports



▌Download Cable

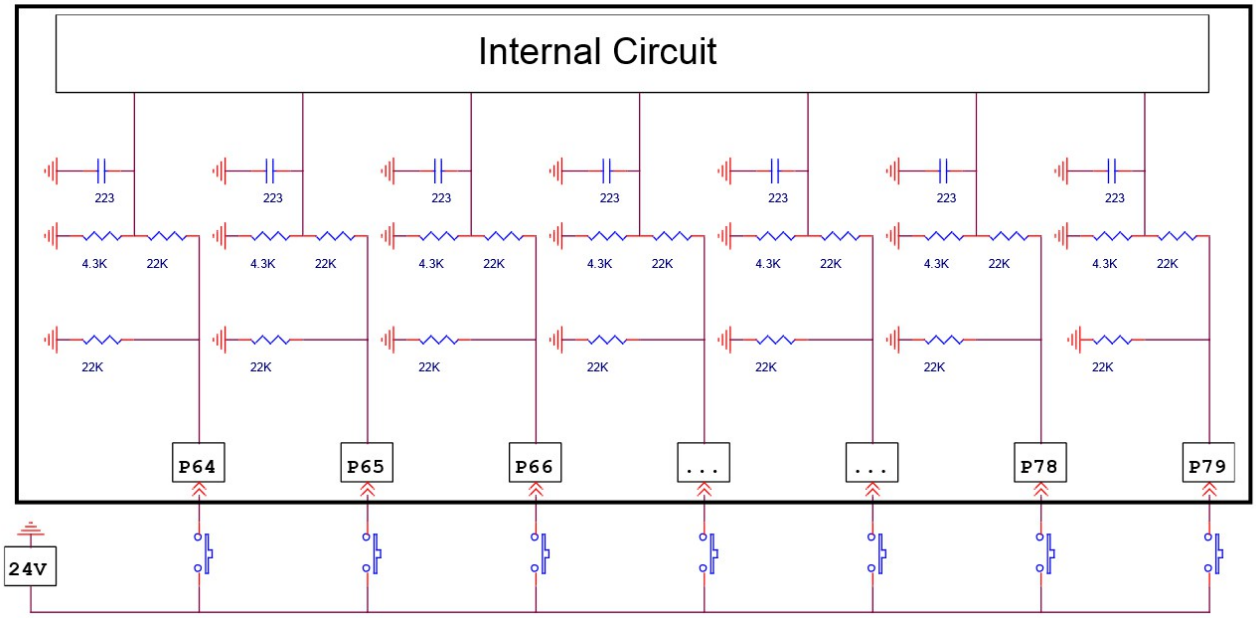
If you have an RS-232 serial port on your PC, the 3-pin download cable is recommended. If you only have a USB port on you PC, a USB-to-Serial cable be used to give you an RS-232 serial port to which you can conned the 3-pin download cable. If using a USB-to-Serial cable, drivers will likely be required. Please refer to the cable's product manual.

RS-232 3-pin Download Cable	USB-to-Serial & 3-pin Download Cable

※The 3-pin download cable is not included. When making your first UISB-420T, please be sure to also purchase the download cable.

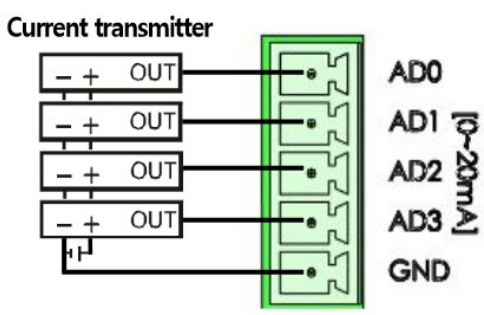
6. Circuit and Specifications

▌Input

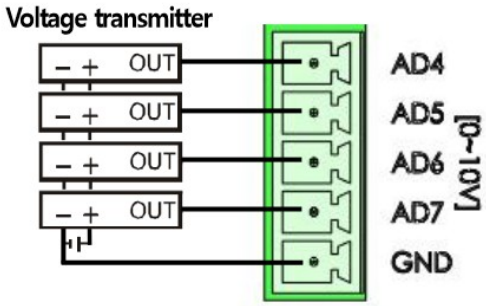


An input signal of approximately 16~24V will be read as a logic high.

▌ADC



[0~20mA]



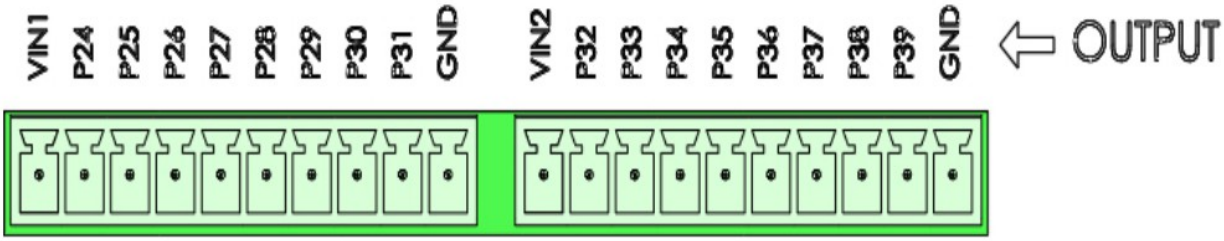
[0~10V]

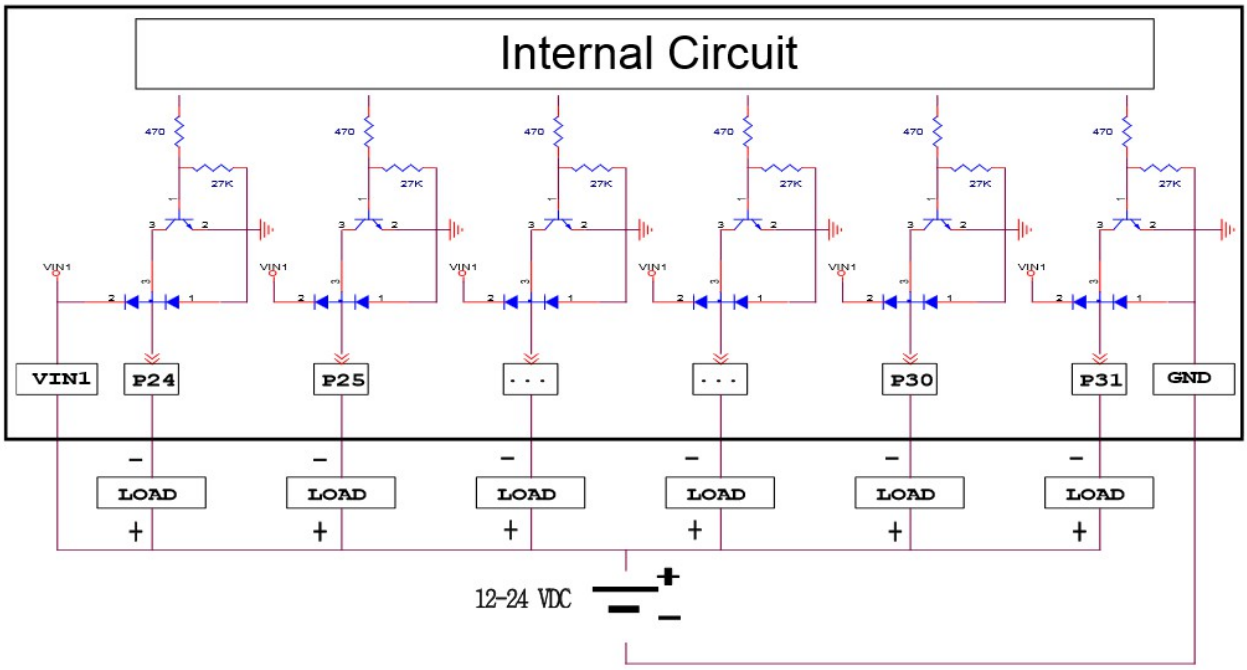
ADC for receiving analog input.

Channel	Measurable Range	Value Range	Resolution	Precision
AD0, AD1, AD2, AD3	0~20mA	0~1023	10-bit	Approx. ±1%
AD4, AD5, AD6, AD7	0~10V	0~1023	10-bit	Approx. ±1%

※ **Caution:** Supplying an input signal outside of the measurable range could result in damage.

Output





Outputs are in an open collector configuration. Voltage does not occur at VIN. When connecting and inductive load, please wire VIN for surge protection.

※ **Caution:** Due to the open collector configuration please be sure to always supply a load between the external voltages source and the output pin. Directly connecting a voltages source without a load will provide a virtual short circuit to ground, possibly damaging the internal transistor.

8. Command Description

Cubloc Studio supported functions can be used to control the UISB-420T's digital, analog, and communication ports. Letters, numbers and symbols can be displayed on the character LCD with the Cubloc Studio's CLCD commands. To read input from the kepad, Cubloc Studio's Pad functions can be used. **Please see the Cubloc User's Manual for detailed instructions.**

▌Character LCD Display

Set Display

```
Set Display  kind,  method, baud(ID), buffersize
```

kind : 0=ALCD / HLCD, 1=GHLCD GHB3224, 2=**UISB-420T** / CLCD

method : Communication Method 0=CuNET, 1=RS232 CH1, 2=RS232 CH2, 3=RS232 CH3

baud(ID) : **UISB-420T=0**

bufferSize: Send buffer size

This command must be present at the beginning of your program before any other command character LCD command can be used. See the Cubloc User's manual for more information.

Example:

```
Set Display 2,0,0,200   'CLCD , CUNET, Slave Address 0, send buffer – 200 bytes
```

Cls

```
CLS
```

Clears the LCD. A short delay of 20ms may be needed after executing this command. See the Cubloc User's manual for more information.

Csron

```
CSRON
```

Shows the cursor. See the Cubloc User's manual for more information.

Csroff

```
CSROFF
```

Hides the cursor. See the Cubloc User's manual for more information.

Clcdout

```
CLCDOUT x, y, text
```

x: x-coordinate of LCD

y: y-coordinate of LCD

text : The text to display

Displays the text at the given position (x, y). See the Cubloc User's manual for more information.

Example:

```
CLCDOUT 1, 0, "COMFILE"       'Display "COMFILE" at 1,0
CLCDOUT 1, 1, DEC i           'Display, in base 10, value stored in i at 1,1
CLCDOUT 1, 2,"COMFILE",DEC i 'Display "COMFILE" and the value stored in i at
                              ' 1,2
```

※ When displaying multiple strings in a row, it can be helpful to add a short delay between each `CLCDOut` command.

```
Do
  CLCDOut 1, 0," COMFILE UISB-420T "
  Delay 10
  CLCDOut 1, 2, "System count: ", DEC I
  Incr I
  Delay 1000
Loop
```

Locate

`Locate x,y`

x : x-coordinate

y : y-coordinate

Sets the position of the text cursor. After the CLS command, the cursor defaults to 0,0. See the Cubloc User's manual for more information.

```
Locate 1,1   'Move cursor to position 1,1
```

Light

`Light On/Off`

`On/Off` : Backlight 0=Off, 1=On

Turns the LCD backlight on or off.

```
Light 1  'Turn backlight on
```

Special Commands

LED ON/OFF

`Print  27, 69, n1, n2`

n1: LED position (0~4)

n2: 0=OFF, 1=ON

Turns one of the 4 LED indicators on or off.

```
Print  27, 69, 1, 1     'Turn LED 1 On
```

Buzzer ON/OFF

```
Print 27, 80, n1
```

n1: 0=OFF, 1=ON

Turn button press audio feedback buzzer on or off.

```
Print 27, 80, 1       'Turn buzzer on
```

Buzzer Duration

```
Print  27, 90, n1, n2
```

n1: low value

n2: high value

Sets buzzer duration to (n2 – *n1*) * 200ms.

```
Print 27, 90, 0, 5  'Sets buzzer duration to 1000ms (1 second)
```

LCD Display

The following program displays a counter incrementing by 1 approximately every second.

```
Const Device = CB400          ' UISB-420T uses the Cubloc CB400 Modeule
Dim i As Byte
Set Display 2,0,0,20          ' CLCD Initialization
i =0
Cls                           ' Clear the screen
Delay 200                     ' Delay 20mS
CsrOff                        ' Hide the cursor
Light 1                       ' Turn on the backlight
Do
       Incr i                 ' Increment counter

       ' Display string at 0,0
       Clcdout 0, 0, " COMFILE UISB-420T "

       Delay 10

       ' Display count value at 0,2
       Clcdout 0, 2, " COUNTER :   ", Dec I

       Delay 1000
Loop
```

▌Reading Input from the Keypad

The UISB-420T can process key presses from its integrated keypad using commands `Set Pad`, `On Pad Gosub`, and `GetPad`.

Set Pad

`Set Pad mode, packet, bufferSize`

mode : Bit mode (0 to 255)
packet : Packet size (1 to 255)
bufferSize : Receive buffer size (1 to 255)

Before the keypad can be used, it must be initialized using the following command. See the Cubloc Manual for more information.

```
Set Pad 0, 1, 20
```

On Pad

`On Pad GoSub label`

Causes the program to jump to label on a keypress. See the Cubloc User's manual for more information.

```
On Pad Gosub OnKeyPress      ' Jump to OnKeyPress when key is pressed

OnKeyPress:
    A = Getpad(1)            ' Read a byte from the receive buffer
    CLCDOut 11, 1, hex2 A    ' Write value read to the LCD
    Return
```

Getpad( )

```
variable = GetPad(length)
```

length: The number of bytes to read from the receive buffer

Reads length bytes from the receive buffer. For the UIF-420, when a keypress occurs, one byte is stored in the receive buffer.

```
A = Getpad(1)    'Gets 1 byte from the receive buffer and store it in A
```

Receiving Data from the Keypad

The following code displays the scan code for each keypress.

```
Const Device = CB400      ' UISB-420T uses the Cubloc CB400 Modeule
Dim A As Integer
Set Display 2,0,0,200     ' CLCD Initialization
Set Pad 0,1,20            ' Keypad Initialization
On Pad Gosub OnKeyPress   ' Jump to OnKeyPress when key input is received
Cls                       ' Clear screen
Delay 20                  ' 20 ms Delay
CsrOn                     ' Show cursor

CLCDOut 0,0,"##### COMFILE #####"
Delay 10
CLCDOut 0,1,"KEY INPUT : "

Do                        ' Main program loop. Run Forever
Loop

OnKeyPress:
 A=Getpad(1)              ' Get scancode for keypress
 CLCDOut 11, 1, hex2 A    ' Display scancode on LCD
Return
```

Device Control Commands

UISB-420T's rear panel digital and analog I/O on the rear can be controlled with the many features of the integrated Cubloc CB400 and Cubloc Studio.

Out

```
Out Pin, Value
```

Pin : The Output pin to use (P24~P36)
Value : The value to output (1 for logic high, 0, for logic low)

Outputs a 1 (logic high) or a 0 (logic low) to the specified pin. See the Cubloc User's manual for more information.

```
OUT 24,1  'Outputs a logic high to P24
OUT 24,0  'Outputs a logic low to P24
```

In()

```
variable = In(pin)
```

variable: The variable to store the result
pin : The int to read from (P64~P74)

Returns the current state of the specified pin. See the Cubloc User's manual for more information.

```
Dim A As Byte
A = In(64)     'Read state of P64 and store the result in variable A
```

Adin()

```
variable = ADIn (channel)
```

variable: The variable to store the result
channel : Analog input channel (0~7)

Samples the the analog signal on the specified channel. The UISB-420T has 4 10-bit current analog-to-digital channels (0~3) and 4 10-bit voltage analog-to-digital channels (4~7). See the Cubloc User's manual for more information.

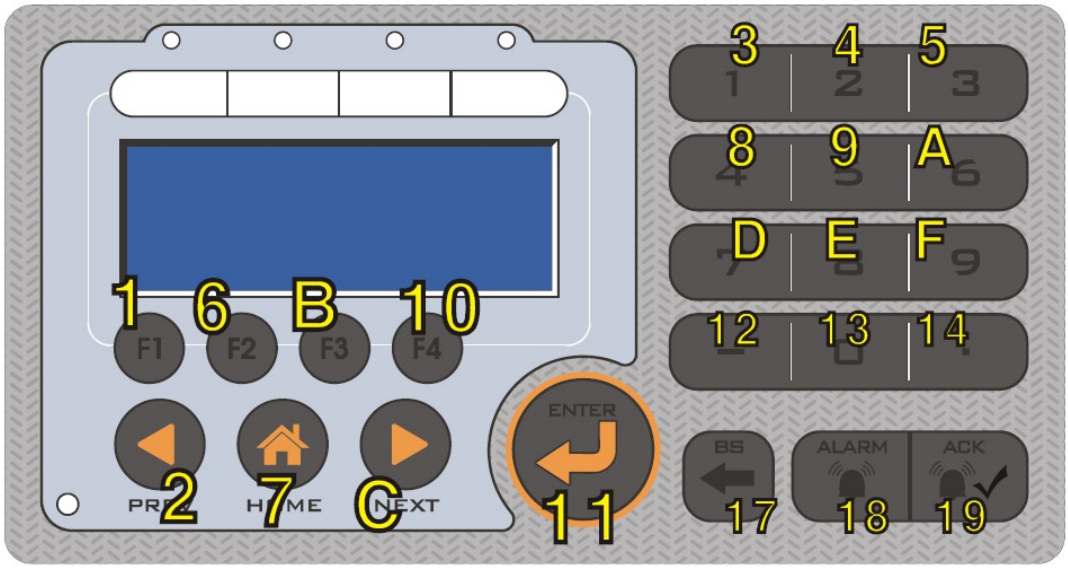
```
A = Adin(0) 'Sample analog signal on channel 0
```

Serial Communication

The UISB-420T has two serial communication channels: Channel 1 for RS-485 and channel 2 for RS-232. Please see the Cubloc User's manual for detailed information on programming the integrated Cubloc CB400 for serial communication.

8. Key Scancodes

The UISB-420T has a total of 23 keys sealed in a water-resistant membrane. Each key is assigned a unique scancode that will be received by the integrated CB400 when the key is pressed.



UISB-420T Scancodes

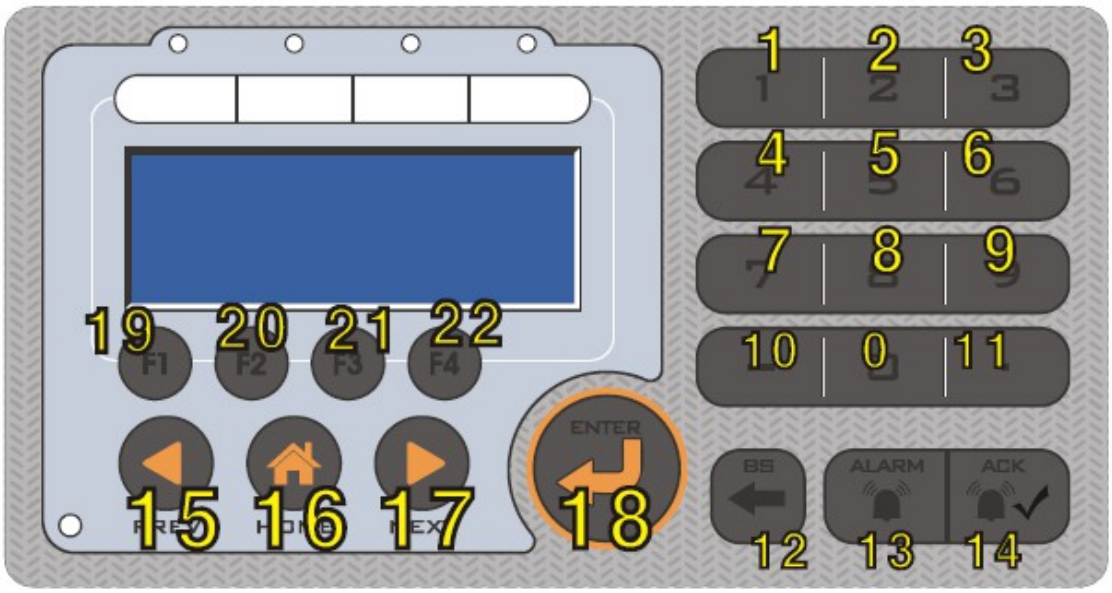
Scancode Conversion

The scancodes are highly irregular, but getting the appropriate value for each keypress can be determined using the simple program below. Each scan code is an index into the array SCANCODETB.

```
Const Device = CB400

Dim SCODE1 As Byte
Const Byte SCANCODETB = (&HFF,19,15,1,2,3,20,16,_
4,5,6,21,17,7,8,9,22,18,10,0,11,&HFF,&HFF,12,13,14)
Dim A As Integer
Set Display 2,0,0,20
Set Pad 0,1,20
On Pad Gosub KEYPROCESS
Cls
```

```
Wait 10
Csroff
Clcdout 0, 0, "COMFILE"

Do
Loop

KEYPROCESS:
 SCODE1=Getpad(1)
 Clcdout 2, 2, DEC2 SCANCODETB(SCODE1)
Return
```

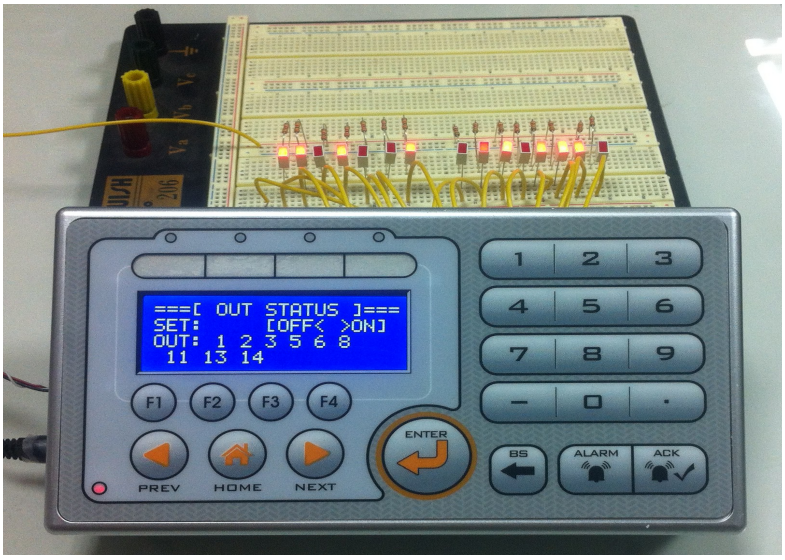
The code above will convert each scancode into regular decimal number as depicted below. Of course, further processing will need to be added to take action on a given keypress.



After scancode conversion

#. UISB-420T Examples

Output Port Control using Keypad



[Video] http://www.youtube.com/watch?v=nTm2rXJJcIg&feature=youtu.be

```
Const Device = CB400
Ramclear
Set Display 2,0,0,200
Set Pad 0,1,20
On Pad Gosub ABC
Const Byte SCANCODETB =
(&HFF,19,15,1,2,3,20,16,4,5,6,21,17,7,8,9,22,18,10,0,11,&HFF,&HFF,12,13,14
)
Const Byte io_out = (24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39)
Dim INKEY As Byte
Dim CNT   As Byte
Dim OUT_PORT(16) As Byte            ' Output ports
Dim Out_SET_DATA As Byte            ' Output port number(0~15)
Dim NUM_IDX As Byte                 ' Output port index
Cls
Delay 100
OUTPUT_DISPLAY
Do
Loop
ABC:
INKEY = SCANCODETB(Getpad(1))
KEYIN_PARSING INKEY
Return
```

```
'_______________________________OUT DISPLAY_____________________________________
Sub OUTPUT_DISPLAY()
       Clcdout 0,0, "===[ OUT STATUS ]==="
       Clcdout 0,1, "SET:"
       Clcdout 9,1, "[OFF< >ON]"
       Out_Detect_display
End Sub
'_____________________________OUT DETECT DISPLAY_______________________________
Sub Out_Detect_display()
Dim STR_1INDX As Byte
Dim STR_2INDX As Byte
Dim _SPACE As Byte
Dim CT0 As Byte
Dim CT1 As Byte
CT0 = 4
CT1 = 0
STR_1INDX = 0
STR_2INDX = 0
_SPACE = 2
       Clcdout 0,2,"                    "
       Clcdout 0,3,"                    "
       Clcdout 0,2,"OUT:"
       Delay 10
              For CNT = 0 To 15
              If OUT_PORT(CNT) = 1 Then
                     If CT0 <19 Then
                            Clcdout CT0, 2,  Dec CNT
                            If CNT>9 Then
                                   CT0 = CT0+3
                            Else
                                   CT0 = CT0+2
                            Endif
                     Else
                            Clcdout CT1, 3, Dec CNT
                            If CNT>9 Then
                                   CT1 = CT1+3
                            Else
                                   CT1 = CT1+2
                            Endif
                     Endif
              Endif
       Next

End Sub
```

```
'_________________________OUT ERROR DISPLAY_____________________________
Sub Out_IODEVICE (PORT As Byte, OnOFF As Byte)
If PORT < 16 Then
       OUT_PORT(PORT)  = OnOFF
       Out io_out(PORT), OnOFF
       Out_Detect_dipaly
Else
       Clcdout 0,2,"  [###! Error !###] "
       Clcdout 0,3," [CHECK PORT NUMBER]"
Endif
Delay 1000
OUTPUT_DISPLAY
End Sub

'___________________________________KEY IN_____________________________________
Sub KEYIN_PARSING (KEY As Byte)
OUTPUT_DISPLAY
Select Case KEY
       Case Is < 11
              If NUM_IDX =2 Then
                     Clcdout 6,1,"  "
                     Out_SET_DATA = 0
                     NUM_IDX = 0
              Endif
              Clcdout 6+NUM_IDX,1,Dec KEY
              If NUM_IDX = 0 Then Out_SET_DATA = KEY Else Out_SET_DATA =
Out_SET_DATA*10+KEY
              Incr NUM_IDX
       Case Is = 17
                     If Out_SET_DATA >= 0 Then Out_IODEVICE Out_SET_DATA,
1
                     NUM_IDX = 2
                     Out_SET_DATA = 0
                     Clcdout 6,1,"  "
       Case Is = 15
                     If Out_SET_DATA >= 0 Then Out_IODEVICE Out_SET_DATA,
0
                     NUM_IDX = 2
                     Out_SET_DATA = 0
                     Clcdout 6,1,"  "
       End Select
End Sub
```

ADC Display

[Video] http://www.youtube.com/watch?v=XsVIwFvQ6U4

```
Const Device = CB400
Ramclear
Set Display 2,0,0,200
Dim CNT   As Byte
Dim ad_data(8) As Integer  'ADC Port Array
Cls
Delay 20
Do
       Check_ADC
       ADC_DISPLAY
       Wait 500
Loop
'_________________________ADC Sampling_____________________________________
Sub Check_ADC ()
       For CNT = 0 To 7
              ad_data(CNT) = Adin(CNT)
              If ad_data(CNT)<= 1 Then ad_data(CNT) = 0
       Next
End Sub
```

```
'_____________________________ADC DISPLAY_____________________________________
Sub ADC_DISPLAY()
       Clcdout 0,0,"===[ ADC STATUS ]=== "
       Clcdout 0,1,"AD0: ", Dec ad_data(0)
       Clcdout 0,2,"AD1: ", Dec ad_data(1)
       Clcdout 0,3,"AD2: ", Dec ad_data(2)
       Delay 20
       Clcdout 10,1,"AD4: ", Dec ad_data(4)
       Clcdout 10,2,"AD5: ", Dec ad_data(5)
       Clcdout 10,3,"AD6: ", Dec ad_data(6)
End Sub
```

▌Door Lock Security Key

[Video] http://www.youtube.com/watch?v=xkcRucbZOSU&feature=youtu.be

```
Const Device = CB400
Ramclear
Set Display 2,0,0,200
Set Pad 0,1,20
On Pad Gosub ABC
Dim Inkey As Byte
Dim page As Byte
Dim PS_Len As Byte
Dim cnt As Byte
Dim conf As Byte
Dim pswd(4) As Byte          'password
Dim ck_pswd(4) As Byte       'check password
Dim LOGIN_pswd(4) As Byte    'login password
Const Byte SCANCODETB = (&HFF,19,15,1,2,3,20,16,
4,5,6,21,17,7,8,9,22,18,10,0,11,&HFF,&HFF,12,13,14)
Cls
Delay 100
Csron
```

```
home_page
Do
Loop
'_________________________Inkey-PARSING_____________________________
ABC:
Inkey = SCANCODETB(Getpad(1))
       Select Case Inkey
              Case 19
                     page = 1
                     Cls
                     Delay 100
                     Clcdout 0, 0, " =[ SET PASSWORD ]= "
                     Clcdout 0, 1, "PASSWORD: "
              Case 20
                     page = 2
                     Cls
                     Delay 100
                     Clcdout 0, 0, "=====[ LOGIN ]====="
                     Clcdout 0, 1, "PASSWORD: "
              Case 16
                     home_page
       End Select

       If (0 <= Inkey)And(Inkey <= 9) Then
              Select Case page
                     Case 1
                            setpass_page Inkey
                     Case 2
                            login_page Inkey
              End Select
       Endif
Return
'_________________________HOME LOGIN_____________________________
Sub home_page ()
       Cls
       Wait 20
       Clcdout 0, 0, "===[ DOOR  LOCK ]==="
       Clcdout 0, 2, "F1>> [SET PASSPWORD]"
       Clcdout 0, 3, "F2>> [ LOG-IN ]"
       INTI_DATA
End Sub
```

```
'_________________________SET PASSWORD_____________________________________
Sub setpass_page (key As Byte)

       Clcdout 0, 0, " =[ SET PASSWORD ]= "
       Clcdout 0, 1, "PASSWORD: "

       If PS_Len <4 Then
              Locate 10+PS_Len, 1
              pswd(PS_Len) = key
              'Clcdout 10+PS_Len, 1,"*"
              Clcdout 10+PS_Len, 1,Dec pswd(PS_Len)

       Endif
       If PS_Len = 3 Then
              Clcdout 0, 2, "Check PW: "
       Endif
       If PS_Len >3 Then
              Clcdout 0, 2, "Check PW: "
              ck_pswd(PS_Len-4) = key
              'Clcdout 10+PS_Len-4, 2,"*"
              Clcdout 10+PS_Len-4, 2,Dec pswd(PS_Len)
       Endif
       Incr PS_Len

       If PS_Len >7 Then
              For cnt = 0  To 3
               If pswd(cnt) >< ck_pswd(cnt) Then conf = 1
              Next
              Locate 0,3
              If conf = 0   Then
                     Clcdout 0, 3, "=Succeed Password!="
              Else
                     Clcdout 0, 3, "=Confirm Password!="
              Endif
              INTI_DATA
       Endif
End Sub
```

```
'_____________________________LOGIN_____________________________
Sub login_page (key As Byte)

       Clcdout 0, 0, "=====[ LOGIN ]====="
       Clcdout 0, 1, "PASSWORD: "

       If PS_Len <4 Then
              Locate 10+PS_Len, 1
              LOG_pswd(PS_Len) = key
              'Clcdout 10+PS_Len, 1,  "*"
              Clcdout 10+PS_Len, 1,  Dec LOGIN_pswd(PS_Len)
       Endif
       Incr PS_Len

       If PS_Len >3 Then
              For cnt = 0  To 3
               If pswd(cnt) >< LOGIN_pswd(cnt) Then conf = 1
              Next
              Locate 0,3
              If conf = 0   Then
                     Clcdout 0, 2, "  !! Wellcome !!  "
                     Clcdout 0, 3, "=Succeed Password!="

              Else
                     Clcdout 0, 2, "    !! Error !!    "
                     Clcdout 0, 3, "=Confirm Password!="
              Endif
              INTI_DATA
       Endif
End Sub

Sub INTI_DATA ()
       page = 0
       PS_Len = 0
       cnt = 0
       conf = 0
End Sub
```